Comments on NPRM – Docket 06-229

General

It is difficult to overstate the value this initiative can have on the ability of our public safety agencies to perform collaboratively anywhere they are called. Carried to its potential it can deliver a nationwide, flexible, interoperable, spectrally efficient, and secure public safety network. This is a rare chance to break out of our present narrowband, locally centered, and poorly interoperable public safety communications structure. The opportunity is too important not to do right. In that regard I would like to address a number of issues in the NPRM.

Technical Issues

System and Deployment Issues

For the system to support public safety collaboration anywhere in the U.S. and to be able to draw on the needed information resources wherever units are called, it makes sense that the digital nodes of this new public safety network be Internet compatible. With the advent of IPv6, each radio can have a valid IP address, or any temporarily constituted radio network can have one or more gateways that perform the necessary address conversions for Internet compatibility. More on naming and addressing below.

Bringing adequate public safety communications to a disaster area should not necessarily rely on any system in place. Any disaster big enough to require outside help will likely have impacted existing communications. Thus, one service logically provided by a centralized administrative body would be to have on-hand a complete set of transportable equipment capable of overlaying the affected area. This would include a switching fabric of portable routers and gateways plus those servers needed to establish and maintain network operations. The implementation would be much more efficient and cost effective than having local or relocated groups to do this.

Any network deployed for disaster relief must itself be survivable, either to further damage or deliberate attack. The underlying packet technology of the Internet has that potential if properly used. Enabling redundant routes and having multiple or distributed network management servers, all performing automatically, are mandatory design features. The technology must easily avoid any single-point failures that could terminate all communications.

In what follows I will try to make a case for a central authority, not necessarily government but certainly non-profit, that would bring about a public safety radio-based emergency deployable internet (REDINET) into

existence, assure its interoperability and security, and be able to establish it rapidly in any disaster location in the nation. The radios themselves and other terminal equipment to be used would belong to the relocating local agencies who would have, over time, transitioned them into everyday use in their own jurisdictions. The advent of this new spectral block is a splendid opportunity to begin replacing present narrowband equipment with much more flexible broadband technology. To help that transition, one of the 6 MHz broadband frequency blocks could be reserved for local use and one or more of the others for national emergencies involving relocations.

Spectrum allocation and assignment

The disjoint nature of the two 6-MHz blocks of spectrum poses some radio hardware issues but, if left in that configuration, suggests two separate wideband multiple-access channels. Each could be a single CDMA entity but both would be accessible in a dual channel radio, each selectable or as one solid block. On the other hand, the comparative value of the equal-sized block of narrowband channels is not clear. Trying to manage these channels will grossly encumber the integration of new human and equipment resources, both administratively and technically. Finding a channel management scheme, whether the channel is defined in frequency or time, is a difficult problem, particularly when the resources are mobile. Therefore, the value to public safety of the narrowband channels noted in this particular notice seems illusive. I have not doubt that the future favors broadband IP-based communications, so the whole subdivision of this 24 MHz band should be redrawn with that technology in mind. More on this later.

Multiple Access, Naming, and Addressing

The virtues of all radios being on the same broadband channel go beyond just simplicity and the lower cost of radios. Broadband multiple-access is more spectrum-efficient, offers a greater ease of radio resource management, and more gracefully accommodates channel loading.

Given the time frame of implementation of this rulemaking, it is best to consider the use of IPv6 in equipment design. Hence, each radio can have both a unique symbolic name, hopefully aligned sufficiently with it owning organization as to be intuitive, and a unique IP address. Though a mobile IPv6 node may still have a temporary address, all routers of that era will be able to interpret that address for nearby routing as well as associating it with its normal “home” address. Location-independence, a highly desirable feature of a new IP-based network, will be more fully realized. For name-address service hosts (directory service) to become aware of a new or relocated radio (host), some announcement packet must be sent, implicitly or otherwise. If the mobile radios lie behind some new protective gateway, then some form of dynamic name-address binding may be necessary as address translation

units do today. To avoid single point of failure, there must be multiple versions of such servers. The use of Internet-compatible names and numeric addressing would also open potential compatibility with future mobile and fixed military units as they also move toward IPv6 addressing.

Anytime disaster-created need outstrips the first response or recovery units intended to meet them, priority will be critical. This need must carry over to the supporting communications systems. In addition to priorities imposed by the event, there are also varying types of traffic with different degrees of importance and bandwidth requirements. Given that the spectrum is a limited resource, some control will be needed over excessive high-bandwidth uses. These and other uses such as priority and security can be accommodated under the general heading of quality-of-service (QoS), also a new offering of IPv6.

Licensing and Economic Issues

Single Licensee

Of critical importance in this issue is the authority to centralize the process of network and host naming and addressing, to specify and prove the interoperability of the network radios and their information hosts and servers, and to assure that the procedures for establishing and maintaining a network are in place and understood. In whatever form that authority resides, that entity could also act to give local public safety agencies the benefit of economy of scale in the purchase of new 700MHz-band radios. Their design, however, should be done collaboratively between this central authority and the information technology industry as long as industry does not prolong its proprietary hold and use of old technology. This authority would also have in reserve the aforementioned network operations fabric that could be dispatched quickly to any significant emergency. That doesn't mean it would distribute the radios or other terminal equipment, which, for effective use and for reasons stated above, would be in the hands of the operating units.

This authority should also be non-profit to avoid any commandeering of the products to be offered and to prevent a monopoly in their availability. However, it is less clear that a single licensee, non-profit or otherwise, should offer the 700 MHz spectrum to public safety agencies on a fee basis but that source of revenue would be overwhelmingly favorable to the sharing of any single portion of it with commercial subscribers.

Commercial Sharing (Para. 19)

The Notice suggests that disasters are so infrequent and so out of phase with commercial communications needs, that countless channel-hours are

available for secondary commercial licensing. That may be true, particularly in light of geographic channel reuse. But there are compelling reasons not to rush into this world of sharing the exact block of spectrum across disparate interests, the reversal or abandonment of which may be difficult or impossible.

First, there is the likelihood that in large metropolitan areas there will be a concurrent, not disjoint demand between the need for disaster response and the desires and needs of commercial subscribers. All people and businesses will see an increased and legitimate need to communicate during a difficult time. If preemptive sharing were to occur, it would seem that significant discounting of the channel for that loss of access would be necessary unless compensated for very significant features or services. Moreover, removing secondary users during an emergency poses a host of procedural and technical problems, not to mention possible liability. Though the available technology here could be vastly different, there is not a good history of commercial users abandoning their use of channels marked for emergency communications. The GMRS band is a good example. Even if coded squelch commands were radiated not all commercially licensed radios would hear them (hidden terminal problem). Even if the receiver were squelched, repeated attempts to communicate simply raises the background noise level for emergency users.

Second, because of the advanced features of this new offering, public safety communications use will gravitate to this new band, even when collaboration is on a smaller scale and under more local circumstances. Take the Los Angeles area for example. Every year there are many fires that draw support from all parts of the State, the management of which could profit from integrated communications. Even in that more geographically restricted use, holding these new resources for use only under redeployment would mean that each local agency would have an unnatural communications dichotomy and an additional cost to their communications practices. To be used effectively in a national disaster, the radios and terminal equipment are best held and used routinely at the local level. And if the proposed system works better than present systems, as it should, there will be an unavoidable migration to it under non-deployment use. That tendency should be encouraged by making one 6 MHz broadband block available to local public safety agencies and reserve the second such block for national or other collaborative, relocation use. Both must be easily accessible from the same radio or terminal equipment. Certainly, any commercial sharing of those broadband blocks would exacerbate and probably prohibit that beneficial migration.

Third is cost. If this new spectrum and its associated equipment are reserved only for more national emergencies, then its use by chronically under-funded public agencies will mean additional costs over and above that of their normal, locally used communications; hence, the present notion of subsidy by commercial subscribers. But most of the need for subsidy can be completely avoided if the cost of the radios and terminal equipment are borne over time by the agencies that will use them as they replace their existing narrowband gear! Thus, the most logical approach is for the new equipment to gradually displace present public safety communications systems.

As for the remaining cost of a central administrative authority, it can come from direct government or state funding, depending on the scale of the disaster, or from another type of sharing and subsidization. For example, reexamine the use of one of the new 6 MHz narrowband blocks and open it exclusively to commercial subscribers on a permanent, non-preemptive basis. Then assign part of its revenues to support the centralized functions required by the new deployable public safety network. In this way there are no channels shared between commercial and public safety use.

A Need Not Addressed

Finally, there is the matter of a new class of volunteers that many cities are trying to train to help out when local public safety resources are predictably overloaded. Generally, this occurs during any broad-scale disaster. Presently, these volunteers are at the mercy of the FRS/GMRS-band whose restrictions and channel overloading make them woefully inadequate for this kind of use. Some supplementation of or alternative to those bands is necessary. This is another reason not to prematurely surrender too much of the 700 MHz to commercial use…saving a portion of the remaining 6 MHz narrowband block to cover this need.

Background and Attribution

These comments are offered as a private citizen who is currently involved in a review of emergency preparedness communications for the city of Palo Alto CA. My background is, however, also very relevant to the present docket. I was actively engaged in research and development for the very first mobile digital communications systems in the mid-1970s, when packet switching was first brought to computer networking and to radio. These two activities prompt my strong affirmation of the potential of this new public safety band...as long as it remains open to the new IP-based technology. Although the above-mentioned research was done at SRI International (formerly Stanford Research Institute), these comments are attributable only to me.

Respectfully Submitted,

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